



## SHOULD THE CALIFORNIA AVOCADO INDUSTRY CONSIDER "SNAP" HARVESTING?

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Increasing competition from abroad requires a serious look at all aspects of the California avocado farming enterprise. Offshore growers spend as little as one cent per lb. to harvest their avocados, while the average California harvesting cost is greater than 10 cents per lb. and rising. The number of workers available to harvest California avocados is shrinking. Additionally, inexperienced newcomers are replacing

the aging guard of experienced pickers. This article will discuss how "snap" harvesting of avocados can help improve ripe fruit quality and reduce harvesting costs to help California growers remain competitive (Figure 1).

### *Fruit quality issues*

"Snap" harvesting is not a new concept and has already been adopted by other producing countries (Figure 1). The Israeli avocado industry, which exports most of its avocado production to

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## From The Editor

*Guy Witney*  
*California Avocado Commission, Production Research Program Manager*

The CAC Production Research Program's mission is to "provide California avocado growers a means to achieve optimum profitability, now and in the future, through focused research, global collaboration, and effective communication of results." I believe that the articles in this issue of *AvoResearch* encapsulate this mission.

In the cover article, Reuben Hofshi, Chairman of the Production Research Committee, summarizes what we have learned from research about "snap" harvesting fruit in California, and he compares this to the experiences and scientific data collected from other avocado industries. While our industry is a long way from adopting "snap" harvesting as a routine practice, CAC Board Chairman, Jerome Stehly, recently suggested that our industry carefully review "snap" harvesting as a means to reduce grower costs and increase worker safety in the future. We hope that this article stimulates debate on the subject.

In keeping with previous issues, we continue our review of other world avocado industries with a short article on South Africa, the world's largest exporter (by volume) of avocados.

In light of the planting boom currently underway, a brief review of rootstocks is also provided to help growers understand the long-term advantages of investing in clonal rootstock varieties. Finally, Mark Hoddle has provided us with an insert on persea mite. This article summarizes what we know about this serious pest after six years of intensive research. 

## RESEARCH UPDATE

- ▶ Work done last winter by Joe Smilanick, Dennis Margosan and Mary Lu Arpaia with fruit harvested after rainfall, shows that substantial reductions in stem end rots were obtained by storing the fruit at cool temperatures (41 to 50 °F) for several days before ripening.
- ▶ Preliminary data from research being conducted by Pascal Oevering, Ben Faber and Phil Phillips on naturally occurring populations of glassy winged sharpshooters (GWSS) in Valencia orange trees and adjacent avocado trees in Pauma Valley and Fillmore, shows significant movement of adult sharpshooters to avocados from infested citrus, some egg laying on avocado leaves, but very few developing nymphs. They are monitoring the effects of adult GWSS feeding on the trees and developing fruit.

Watch for meeting notices in the AvoGreensheet or log onto [www.avocado.org/growers](http://www.avocado.org/growers) for more information.

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Europe, has been marketing several varieties of “snapped” avocados successfully for many years. Other countries are switching to “snap” harvesting as well. Visits to the Asian markets over the last two years reveal “snapped” Hass from Australia (Figure 2). Avocado growers in Spain are also “snap” harvesting. The driving force behind the Spanish effort is to improve quality by “snap” harvesting their late season Hass targeted for the French market. Various studies conducted in Spain demonstrated that late season Spanish Hass avocados have high levels of stem end rots, which could be significantly reduced by “snap” harvesting. A recent e-mail (April 2002) from Dr. José Maria Farré, a researcher in Malaga, Spain, summarizes the situation in Spain:

“Since January (2002) we have been marketing snapped and clipped fruit (from different growers) without any problem. After further studies this year, it does not appear that dew markedly increases stem end rot under our conditions. Spanish workers do not

like to pick on wet trees anyway so I think that the snapped-clipped discussion is over. Practically all our postharvest studies this season have been done with snapped fruit.”

The California avocado industry recognizes that fruit quality plays an increasingly important role in the competitive avocado marketplace and therefore requires critical attention. Growers and marketers have always associated “snapped” fruit with the inferior quality of stem-out fruit resulting from over maturity, stress and windfalls. This is an unfounded perception resulting from years of habitual clip harvesting of avocados and lack of knowledge. In fact, several researchers have demonstrated that “snapped” Hass fruit quality is comparable to that of “clipped” fruit. Dr. M. L. Arpaia conducted a two-year study, funded by CAC, with fruit from three groves in Ventura County harvested every six weeks, from January through August. She found that overall the “snapped” fruit ripened slightly faster and had slightly greater weight loss as compared to the “clipped” fruit. More importantly she noted that late season, beginning in June, “clipped” Hass had a significantly higher incidence of stem end rot as

compared to the “snapped” fruit, similar to the Spanish observations. Working with Dennis Margosan and Dr. Joe Smilanick of USDA-ARS, she was able to demonstrate that the type and infection level of pathogens causing stem end rot in the “clipped” fruit were more severe than with the “snapped” fruit. In short, the collaborative research by Arpaia, Margosan and Smilanick found no evidence to indicate that Hass avocados should not be “snap” harvested under the less humid conditions in California. It is likely that the California Hass avocado can be successfully “snap” harvested. Similar research in New Zealand by Dr. Allan Woolf and Anne White of HortResearch, concluded that when environmental conditions were “dry” that “snap” harvested Hass were of higher quality than their “clipped” counterparts. This is primarily due to a reduced incidence in decay.

An interesting side outcome of the California research was the demonstration that the number of decayed fruit increased immediately after a rain regardless of picking method; although in this case the percentage of decayed fruit was greater in the “snapped” fruit. The lesson learned is that avocados should not be harvested by either method during or immediately after rain and before the trees have adequate time to dry out. The effect of rain on incidence of rots is corroborated by the research conducted by Woolf and White in New Zealand. If you are interested in learning more about California “snap” experimental results, visit the links at the end of this article.

### *Picking method comparison*

A comparison between the two picking methods illustrates that “snap” harvesting could result in considerable labor savings. The number of moves required to harvest a single avocado and place it in a picking bag is used here as a means to calculate the rate of harvest by a



Figure 1. An example of “snapped” and “clipped” Hass avocados. (Photo, M.L. Arpaia)



Figure 2. "Snapped" Hass avocado fruit from Australia in the Hong Kong Wholesale Market (August 2001). (Photo, A. Woolf)

picker. Two complementary methods are commonly employed depending on tree height and if a picking pole is needed. One technique, termed "3+ moves", is used to clip the fruit that is reachable by hand. The picker holds the avocado in one hand, clips the stem with the clippers held in the other hand and places the fruit in the picking bag. Often the picker clips the stem at a short distance away from the stem-end and re-clips it a second time before placing the fruit in the bag. The same method is used when placing a ladder against the tree and picking what is reachable by hand. The second technique, termed "4 moves", is employed when using a picking pole. The fruit is first clipped by the clippers at the tip of the pole; the fruit is brought out of the pole bag, re-clipped and placed in the picking bag. The "3+ moves" and the "4 moves" methods described above are practiced by the majority of California pickers.

There are some experienced pickers who manage to clip the avocado and place it in the picking bag with one hand in one sweeping move. However, there is a tendency to clip a portion of the skin near the stem-end with this method, which can result in fruit injury.

To illustrate the potential for labor savings using the "snap" harvesting method, a comparison of the number of moves required to commercially strip harvest a 15-20 ft. tree with 100 lbs. of fruit averaging 7 oz., which is a total yield of 227 fruit. The fruit distribution on the tree is such that 40 lbs. are harvested from the ground by hand; 20 lbs. are harvested by hand off a ladder; and the remaining 40 lbs. are picked with the aid of a picking pole either from the ground or off the ladder. Therefore 60 lbs. or 136 fruit are picked by hand, and the remaining 40 lbs. or 91 fruit are picked with the aid of a picking pole. The picker who

clips the fruit with the "3+ moves" method requires 408 moves to pick the 136 avocados harvestable by hand. The remaining 91 fruit are picked by the "4 moves" method and require an additional 364 moves. The total moves required to harvest 100 lbs. in the "clip" method is 772. The same fruit picked by "snap" harvest require a maximum of 1 move (snap and place in the picking bag in one move) to harvest the fruit reachable by hand from the ground or the ladder (the word maximum is used because often both hands are "snapping" 2 individual fruit simultaneously and thus reducing the number of moves even more). Therefore the 136 fruit reachable by hand require 136 moves. The remaining 91 fruit to be harvested with a picking pole require 3 moves each, (the stem is snapped while the fruit is being removed from the pole bag and placed in the picking bag) for an additional 273 moves. A total of 409

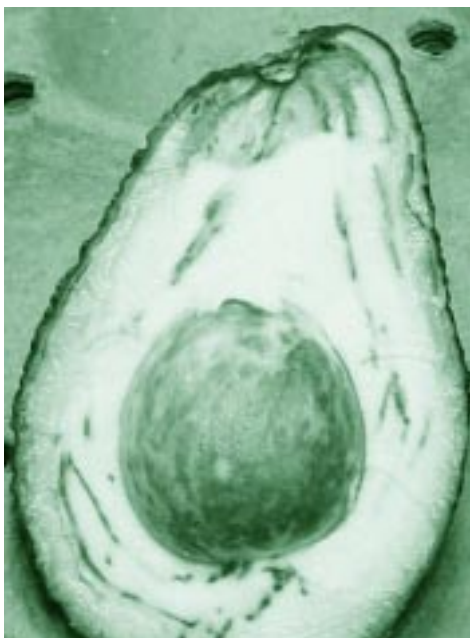
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moves are required to “snap” harvest the same number and distribution of avocados. This equates to 47% fewer moves than in clipping.

## *Cost analysis comparison*

The current average picking cost using the clip method is about 10-14 cents per lb. with early size picking costs ranging much higher. So a 30% reduction in the rate associated with picking becomes meaningful. For example: In a 385 million pound Hass crop year, the industry’s cost to harvest the crop at an average rate of 10-14 cents per pound, will total \$38.5 - \$54 million. Therefore with a 30% savings, growers could potentially save \$11.5 - \$16.2 million if “snap” harvesting is adopted. In other words, a grower with 10,000 lbs. per acre currently pays \$1,000 - \$1,400 per acre to strip harvest the trees. “Snap” harvesting can potentially reduce the cost to \$700 - \$980 per acre. Obviously not all trees are 15 to 20 ft. tall, and the numbers presented above are only an illustration of potential savings and are by no means absolute. Pickers’ experience,



*Figure 3. Stem end rot is caused by a number of postharvest fungal diseases and is manifested in discoloration of the fruit stem end. The vascular bundles of the fruit may also darken. (Photo, M. L. Arpaia)*

terrain, fruit load, tree fruit distribution, tree height and overall accessibility will all influence real savings. In Israel where harvesting is done from cherry pickers, increased productivity/cost savings by “snap” harvesting is reported to be approximately 50%.

## *Manpower*

The availability of farm labor, in general, and experienced avocado pickers in particular, is becoming scarcer each year. Avocado harvesting, especially size picking, is an art perfected over years of experience. Even a relatively inexperienced “snap” picker can outperform his “clipping” counterpart by significant margins. A given picker will potentially be 30% more productive if he “snaps” the fruit instead of “clipping” it. If the “clip” workforce harvests through the season an average of 1,500 lbs. of Hass avocados per day per picker, a 385 million lb. crop will require approximately 257,000 man-days to harvest. “Snap” picking can reduce the demand for labor through higher productivity of the individual picker, i.e., one picker harvests more avocados per day, and thus the crop is picked with a smaller number of pickers. The reduction in man-days demand will be proportional to the increased efficiency of the pickers “snapping” rather than “clipping” the avocados. Thus a 30% increase in picking efficiency will translate to a potential industry savings of 77,100 man-days.

## *Worker safety*

Clippers are sharp and cumbersome and pickers on ladders or with picking poles need to be mindful of the clippers strung on their finger especially in case of an emergency or a fall. The industry needs to be aware of newly contemplated OSHA rules which may limit or disallow the use of clippers altogether because of the high incidence of carpal tunnel syndrome caused by repetitive motion of clipping.

## *Worker’s compensation considerations*

The availability of sufficient pickers during the entire season and peak demand periods, the basic per pound or per hour pay, the profit margin of the farm labor contractor and the overhead associated with equipment, housing, transportation, taxes and worker’s compensation, all contribute to the cost of harvest. The increase in the minimum wage rate at the beginning of 2002 explains the recent increase in the basic cost per pound. Additionally, in the last year, the worker’s compensation rate for orchard work increased to 20.5%. Discounts for existing policyholders associated with credits plus experience modification bring the rate, in real terms, to an average of 15% of gross payroll.

On February 15, 2002, Governor Davis signed into law AB 749. This law will increase benefits for temporarily and permanently injured workers from \$490 to \$602 weekly starting on January 1, 2003. Benefits will continue to rise until 2005, when the maximum will reach \$840 a week. Starting in 2006, benefits will be adjusted annually based on increases in the state’s average weekly wage. Workers with partial but permanent injuries will see an increase ranging from \$130 to \$270 a week. The current benefits range from \$70 to \$230 a week. In addition, the current maximum death benefit will double to \$320,000. Some business interests estimate the cost increase to the state’s employers at \$3.5 billion. These increases will particularly impact farmers and will significantly influence the harvesting costs of avocados in California and may place harvesting costs at equal or even ahead of water costs!

In conclusion, the California avocado industry will be well served if it seriously considers adopting “snap” harvesting as the method of choice for harvesting Hass avocados throughout

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the season. Although studies are still needed to demonstrate the acceptability of “snapped” avocados in the trade and marketplace, the research we funded makes a good case in favor of removing the stem and a good starting point for discussion with the buyers. The potential cost savings that “snapped” avocados represent to our industry is substantial. Our goal must be to improve the quality of our avocados, as well as to reduce our costs. In this pursuit, hiding behind traditional customs and perceptions is a habit we cannot afford.

*Links to papers discussing fruit quality of “snapped” avocados:*

Arpaia, M.L. and Hofshi, R. 1998. The feasibility of “snap” harvesting of Hass avocados.

<http://www.avocadosource.com/>

Margosan, D.A., Smilanick, J. L., Arpaia, M.L. and Sievert, J. R. 1999. Fungi isolated from avocados with stem-end rot after “snap” or “clip” harvest. In: M.L. Arpaia and R. Hofshi (eds.), Proceedings of Avocado Brainstorming '99:150-151.

<http://www.avocado.org>

Margosan, D.A. and Smilanick, J. L. 2000. Fungi isolated after harvest from decayed California avocado fruit. California Avocado Research Symposium, October 14, 2000:101-103.

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Smilanick, J.L. and Margosan, D.A. 2001. Management of postharvest decay of avocado fruit. California Avocado Research Symposium, October 20, 2001:115-119.

<http://www.avocado.org>

Wolf, A., White, A., Sievert, J. and Arpaia, M.L. 1999. Summary of New Zealand and Californian experience with “snap” picking. In: M.L. Arpaia and R. Hofshi (eds.), Proceedings of Avocado Brainstorming '99:161.

<http://www.avocado.org>

These articles can also be found through links available at Reuben Hofshi’s web page:

<http://www.avocadosource.com/> 

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